the lungs and lymph nodes. Grinberg said he suspected inhalation anthrax but didn't know for sure. "Perhaps we didn't know definitely, but we were not talking about it much. Honestly speaking, we were very tired, it was hard work, we had a feeling, myself for example, as if we were working under war conditions. They were feeding us, bringing us meals, to the center at No. 40. There was a huge amount of chlorine. Disinfection was done every day. And we were going home on the trams after the working shift, and people were rushing away because we smelled of chlorine. The way I remember it, on the 10th day, about the end of the second week, we were thinking about keeping this material, that it should be preserved and studied."

Although it was prohibited, Grinberg persuaded a friend who was a photographer to secretly take color photographs of the autopsies using East German slide film. Abramova also preserved tissue samples.

In May, as the crisis eased, Nikiforov assembled all those who had participated in the hospital work and told them: the anthrax had come from tainted meat. But quietly, he told Abramova to keep investigating. He played a double game. In public, he was an official of the state, and loyal to the official story. But he also gave the pathologists a private signal to hide and protect their evidence. Nikiforov later died of a heart attack. "We are certain that he knew the truth," Grinberg said.[9]

But the people of the Soviet Union and the outside world did not.

II. Night Watch for Nuclear War

The shift change began at 7 P.M. on September 26, 1983. Stanislav Petrov, a lieutenant colonel, arrived at Serpukhov-15, south of Moscow, a top-secret missile attack early-warning station, which received signals from satellites. Petrov changed from street clothes into the soft uniform of the military space troops of the Soviet Union. Over the next hour, he and a dozen other specialists asked questions of the outgoing officers. Then his men lined up two rows deep and reported for duty to Petrov. Their twelve-hour shift had begun.[10]

Petrov settled into a comfortable swivel chair with arms. His command post overlooked the main floor of the early-warning station

through a window. In front of him were telephones to connect to headquarters and electronic monitors. Out on the floor, beyond the specialists and their consoles, a large map covered the far wall. At the center of the map was the North Pole. Above the pole and beyond it—as it might be seen from space—were Canada and the United States, inverted. Below the pole stretched the vast lands of the Soviet Union. This was the path that nuclear missiles would take if ever launched. The map showed the location of Minuteman missile bases in the United States. Petrov knew those bases held one thousand intercontinental ballistic missiles carrying nuclear warheads that could cross the Arctic and reach the Soviet Union in thirty-five minutes. On the main floor, a dozen men monitored electronic consoles with a singular mission: using satellites to spot a launch and give the leaders of the Soviet Union an added margin of ten minutes' warning, or maybe twelve minutes, to decide what to do.

Petrov, forty-four, had served in the military for twenty-six years, rising to deputy chief of the department for combat algorithms. He was more of an engineer than a soldier. He liked the logic of writing formulas, often using English-based computer languages. On most days, he was not in the commander's chair but at a desk in a nearby building, working as an analyst, responding to glitches, fine-tuning the software. But twice a month, he took an operations shift in order to keep on top of the system.

When Petrov first arrived eleven years earlier, the station was new, with equipment still in crates and the rooms empty. Now, it had grown into a bristling electronic nerve center. Seven satellites orbiting above the earth were positioned to monitor the American missile fields, usually for a period of six hours. Each satellite was a cylinder six feet long and five feet around, and sent streams of data to the command center.[11] The brain of the center was the M-10, the best supercomputer that existed in the Soviet Union, which analyzed the data and searched for signs of a missile attack.

The satellite system was known as Oko, or "Eye," but the individual spacecraft were known to Petrov by simple numbers, one through nine. On this night, No. 5 was reaching the highest point of its orbit, about 19,883 miles above the Earth. From space, it scanned the very edge of the Earth, using infrared sensors to detect a missile launch. The satellite could spot the heat given off by a rocket engine against the black background of space, a delicate trick requiring the satellite to be in the right

position, steady and aimed at the distant point where the Earth met the darkness of the cosmos. Of the whole fleet, No. 5 had the highest sensitivity, but its task was complicated by the time of day. The satellite was aimed at missile fields that were passing from daylight to twilight during Petrov's shift. Dusk was often a blurry, milky zone that confused the satellites and computers. The operators knew of the challenge, and watched closely.

Usually, each satellite picked up fifteen or twenty objects of interest, and the computers at Serpukhov-15 examined the data on each, checking against the known characteristics of a rocket flare. If it did not look like a missile, the objects would be discarded by the computer and a new target grabbed for examination. The computer ran continuous checks against the data streaming in from space. The satellites also carried an optical telescope, with a view of the Earth. This was a backup, allowing the ground controllers to visually spot a missile attack, but the images were dim—in fact, special operators had to sit in a darkened room for two hours so they could see through the telescopes.

On this night, satellite No. 5 was bringing in more data than usual. Instead of fifteen to twenty targets, it was feeding the computer more than thirty. Petrov figured the elevated levels were due to the satellite's heightened sensitivity. They watched it closely as it approached the apogee of its orbit, when it would be positioned to monitor the American missile fields. At 10 P.M., Petrov paused for tea.

Petrov and his men had watched many test launches from Vandenberg Air Force Base in California and from Cape Canaveral in Florida, as well as Soviet test launches from Plesetsk in northern Russia. With the satellites, they could rapidly detect the rocket's bright flare moments after it rose into the sky; they had seen a few tests fail, too.

For all the years Petrov worked at the early-warning center, they had been rushed. The satellite system was put into service in late 1982, even though it was not ready. Petrov and his men were told: it was an important project for the country, don't worry about the shortcomings. They will be fixed later, you can compensate for the problems, look the other way for now. Petrov knew why they were in such a hurry. The United States and the Soviet Union threatened each other with missiles on hair-trigger alert. The two superpowers had between them about 18,400 nuclear warheads poised to be launched from missiles in silos, on sub-

marines hidden under the seas and from bombers. And there were many smaller, or tactical, nuclear weapons arrayed along the front lines of the Cold War confrontation in Europe. In the event of a nuclear attack, a decision whether to retaliate would have to be made in minutes, and enormous efforts were made by each superpower to gain precious time for warning. With ground-based radar alone, which could not see beyond the curvature of the Earth, the incoming missiles might not be detected until the final seven to ten minutes of their flight. But with the early-warning satellites, a launch could be spotted sooner. The Americans already had stationed their satellites to watch over the Soviet missile fields. The Soviet Union was in a hurry to catch up. They rushed to build Serpukhov-15 and launch their own satellites.

A fear haunted the old men who ruled the Soviet Union, led by General Secretary Yuri Andropov, a frail and paranoid former KGB chief who in the autumn of 1983 was suffering from kidney failure. The fear was a sudden attack that might destroy the entire leadership in Moscow before they could leave the Kremlin. If they could be decapitated, wiped out without warning by a surprise attack, their threat to retaliate was simply not credible. That is why Petrov's mission was so important. The satellites, the antennas, the computers, the telescopes, the map and the operations center—they were the night watch for nuclear war.

Petrov heard the rhetoric, but he didn't believe the superpowers would come to blows; the consequences were just too devastating. Petrov thought the Soviet leaders were pompous and self-serving, and—in private—he was disdainful of the party bosses. He did not take seriously their bombast about America as the enemy. Yet the furor in recent months had been hard to ignore. President Ronald Reagan had called the Soviet Union an "evil empire" in March, and only a few weeks before Petrov's night at the operations center, Soviet Air Defense Forces had shot down a Korean airliner in the Far East, killing 269 people.

Petrov saw himself as a professional, a technician, and took pride in overcoming long odds. He understood the enormity of the task, that in early warning there could be no room for false alarms. His team had been driven hard to eliminate the chance for error. While they had tried strenuously to make the early-warning system work properly, the apparatus was still troubled. A system to make decisions about the fate of the Earth was plagued by malfunctions. Of the first thirteen satellites launched in

the test phase from 1972 to 1979, only seven worked for more than one hundred days.[12] The satellites had to be launched constantly in order to keep enough of them aloft to monitor the American missile fields. They often just stopped sending data back to Earth.

At 12:15 A.M., Petrov was startled. Across the top of the room was a thin, silent panel. Most of the time no one even noticed it. But suddenly it lit up, in red letters: LAUNCH.

A siren wailed. On the big map with the North Pole, a light at one of the American missile bases was illuminated. Everyone was riveted to the map. The electronic panels showed a missile launch. The board said "high reliability." This had never happened before. The operators at the consoles on the main floor jumped up, out of their chairs. They turned and looked up at Petrov, behind the glass. He was the commander on duty. He stood, too, so they could see him. He started to give orders. He wasn't sure what was happening. He ordered them to sit down and start checking the system. He had to know whether this was real, or a glitch. The full check would take ten minutes, but if this was a real missile attack, they could not wait ten minutes to find out. Was the satellite holding steady? Was the computer functioning properly?

As they scrambled, Petrov scrutinized the monitors in front of him. They included data from the optical telescope. If there was a missile, sooner or later they would see it through the telescope. Where was it headed? What trajectory? There was no sign of it. The specialists who sat in the darkened room, also watching the telescope, spotted nothing. The computer specialists had to check a set of numbers spewing out of the hard-copy printer. Petrov scrutinized the data on his monitor, too. Could it be a technical error?

If not, Petrov ran through the possibilities. If just one missile, could it be an accidental or unauthorized launch? He concluded it was not likely. He knew of all the locks and precautions—and just one person could not launch a missile. Even the idea of two officers conspiring to launch a missile seemed impossible. And if one missile was launched, he thought, what did that mean? This was not the way to start a nuclear war. For many years, he had been trained that a nuclear war would start only with a massive strike. He said it again, to himself: this is not the way to start a nuclear war.

He had a microphone in one hand, part of the intercom system to the

main floor. With the other hand, he picked up the telephone to call his commanders, who oversaw the whole early-warning system, including the separate radars. Petrov had to quickly reach his own conclusion; the supervisors would want to know what was happening. He had not completed his own checks, but he could not wait. He told the duty officer, in a clipped tone: "I am reporting to you: this is a false alarm."

He didn't know for sure. He only had a gut instinct.

"Got it," the officer replied. Petrov was relieved; the officer did not ask him why.

The phone was still in his hand, the duty officer still on the line, when Petrov was jolted again, two minutes later.

The panel flashed: another missile launched! Then a third, a fourth and a fifth. Now, the system had gone into overdrive. The additional signals had triggered a new warning. The red letters on the panel began to flash MISSILE ATTACK, and an electronic blip was sent automatically to the higher levels of the military. Petrov was frightened. His legs felt paralyzed. He had to think fast.

Petrov knew the key decision-makers in a missile attack would be the General Staff. In theory, if the alarm were validated, the retaliation would be directed from there. Soviet missiles would be readied, targets fed in and silo hatches opened. The Soviet political leadership would be alerted. There would be only minutes in which to make a decision.

The siren wailed. The red sign flashed.

Petrov made a decision. He knew the system had glitches in the past; there was no visual sighting of a missile through the telescope; the satellites were in the correct position. There was nothing from the radar stations to verify an incoming missile, although it was probably too early for the radars to see anything.

He told the duty officer again: this is a false alarm.

The message went up the chain.

Center for Arms Control, Energy and Environmental Studies at MIPT

False alarm, nuclear danger:

Colonel Petrov's good judgment

by Geoffrey Forden, Pavel Podvig and Theodore A. Postol

This paper was published in IEEE Spectrum, March 2000, V37, Number 3.

Lieutenant Colonel Stanislav Petrov was in command of an early-warning bunker south of Moscow shortly after midnight on 26 September 1983. This was a period of high political tensions between the Soviet Union and the West. The United States was planning openly to deploy in Europe long-range Pershing II ballistic missiles and ground-launched cruise missiles in response to deployments of Soviet intermediate-range SS-20 ballistic missiles.

A particular concern of the moment was that the United States and NATO were organizing a military exercise for later that fall--code-named Able Archer 83--that centered on using tactical nuclear weapons in Europe. Soviet leaders worried that Able Archer was a cover for an actual invasion.

The Soviet Union had constructed a series of ground-based radars ringing the country to detect incoming warheads as they rose above the limb of the earth. The radars' warning might give Soviet leaders as much as 15 minutes to decide on their course of action. In an effort to extend this period of warning to perhaps 30 minutes, the Soviets had just that year incorporated a new space-based early-warning system into their strategic command and control.

Petrov's center was charged with validating any warnings of a surprise nuclear attack that those satellites might generate. Once validated, those warnings would be forwarded to the main Soviet early-warning command center.

Nine Oko satellites had been placed in highly elliptical orbits so they could take turns scanning the skies above U.S. missile fields. On that night in September, Cosmos 1382, whose turn it was to watch the United States, was just then reaching the highest point of its orbit, almost 32 000 km above the earth's surface. Directly below Cosmos 1382, northern Europe was engulfed in night. To a casual observer looking down from space, the snow and ice fields of the Arctic reached out toward the United States, which would have been unrecognizable, since the curve of the earth compressed it into a thin line. The line separating night and day stretched across the North Pole.

If Colonel Petrov had drawn a line from Cosmos 1382 to Malmstrom Air Force Base in Montana--the main U.S. intercontinental ballistic missile (ICBM) field--and continued it out

into space, he would have intersected the sun right at the moment the klaxon went off in his control room indicating the beginning of "World War III."

What was really going on? The guess now is that there were scattered high-altitude clouds above Malmstrom on that day. Such clouds could easily have reflected sunlight into the infrared sensors aboard Cosmos 1382, imitating the bright light given off by the hot gases in a missile's plume. If there were indeed high clouds, the absorbing effects of the atmosphere would have been greatly reduced. Usually infrared light from the sun is reflected off clouds diffusely, which spreads the intensity in every direction.

Near the autumnal equinox, however, the sun could line up with the U.S. missile fields and the satellite to give specular reflections. The clouds would then act as mirrors, reflecting many times more light than they would if the reflection were diffuse. The Soviets had wisely chosen a grazing viewing angle for Cosmos 1382 to increase the effect of atmospheric absorption and remove the unwanted naturally occurring sun background. But instead, this unexpected effect led to a vast increase in the sun-background signal, triggering the alarm in Petrov's center.

Consistent with these speculations based on our analysis, the next year the Soviet Union apparently started dedicating one early-warning satellite in geostationary orbit (positioned over the eastern Atlantic Ocean) to act as a backup to these satellites. This new effort guaranteed that U.S. ICBM fields could always be seen from two very different viewing angles, at least one of which would certainly be free of reflections at any given instant.

Other modifications have since been made to the hardware and software of the early-warning system to filter out these rare events. And, in the process, the Russians have gained more than 15 years' experience and an enviable database of natural phenomena of use in designing future early-warning networks.

When Colonel Petrov had to make his decision, though, none of these improvements had been made. In his control room, he began to receive warnings that U.S. ICBMs were being launched. First one launch, then two, and then others, as different clouds started to reflect light. Eventually five launches were reported. It is possible that these warnings were automatically sent on to the Soviet General Staff, since Petrov's later account suggests that they were calling him, asking for further information.

It is unclear what launch authority arrangements were in place at that time, but it appears that Petrov was under pressure to take some form of action in response to the alert. His understanding was that the United States would only start a war with a massive nuclear attack. Colonel Petrov decided that nobody starts a war with just five missiles.

And so, despite the political tensions at the time, and what appeared to be a limited U.S. nuclear launch, Petrov took no action. He was later investigated for his conduct during the incident. It is Petrov's belief that the investigators tried to make him a scapegoat for the false alarm. Rather than admit that the hardware had been rushed into service and had flaws, the investigators tried to blame it on human error.

This unexpected and all but disastrous incident should add yet another note of caution about the enormously complex and unpredictable warning systems that continue to be operated by

both the United States and Russia. Petrov nowadays lives outside Moscow on a small military pension. The Cold War had many unsung heroes on both sides. Surely Colonel Petrov is one of them.

See the previous page: False alarm, nuclear danger

Your questions and comments to START Web Site Editor | START Forum

Search the START Web site

1995+ warning data ("no missiles of launch")
→ ambiguity
may not be present (against warning;
blind spot;
(U.S. trends using
attack scenarios)
lack of disconfirming warning from
one system
(or 1979 US)
1985 Sept. 83

PETROV 2013

Honoured Ladies and Gentlemen,

Honoured Members of the Friends of Dresden.

From the bottom of my heart I would like to thank you, the organisers of today's ceremony. It is for me a great honour to be chosen to receive the Dresden Peace Prize, here in this grandly beautiful opera house in this magnificent city Dresden.

Please permit me to say a few words about myself. There has been much discussion of my heroism, but I don't tire of repeating that my role – at least according to my understanding – is often exaggerated. In point of fact there is no country on earth in which such weighty decisions always depend on one human being. There are always others who carry joint responsibility.

If I try now to remember that evening, that night: There were no evil forewarnngs; no one could imagine that we would in reality have to work so very hard. It had been a wonderfully beautiful day, dry, warm, at the end of September. I assumed the evening watch as duty officer. I had 140 people under my command, of whom 80 were officers. They were stationed everywhere in the building und were performing their duties as expected. The facility was an appropriately large military area. The Combat Command Centre was large as well, two-storeyed, and as I said there were no alarm conditions. Everything was quiet, as was customary. One could say business as usual. Daily, weekly, the routine was quite normal, but naturally always very cautious. But then it happened: We couldn't be relieved of our watch in an orderly fashion. The electronic clock indicated 00:15 hours; it was the 26th of September 1983. In the Combat Command Centre the siren sounded; on the wall large letters began running across the large viewing screen. Large, blood red letters said „Missile Launch". We were thrown aback, even though we had trained for every eventuality. Indeed, often practiced, but when one is in a drill, he or she knows more or less what will happen. Now, suddenly an emergency was reality. It was a shock. A shock! I began to understand what the computer was saying to me. It had detected a mssile launch from a military base in the USA. On the left side of the screen the base was shown; the computer indicated „maximum probability". I understood as well that the computer had generated this information and passed it on – also to the missile crews, so that they could begin going through their checklists as applicable to the situation. I rose from my armchair, looked through the room into the ground floor, where the missiles were kept and the operators were working. They looked back at me, baffled. A few had jumped up from their workstations, and it became clear to me that should it progress even a bit further, panic would break out. I could see how upset the people were. I had to become loud and order everyone back to his or her battle stations. I ordered that all commands were to

be authorised by me. Then I shifted to the visual mode and got the real-time satellite picture. The visual analysis could not confirm the missile launch. I saw in the real-time satellite pictures the earth's horizon, a part of US territory in the night, then the day-to-night line falling over the USA. I am still precisely aware that the US missile base for which the missile launch was reported was exactly on this day-to-night line. The satellites all were operating normally; no malfunctions had been reported. The ground stations were also working normally. We had three computer centres; nowhere were outages or deviations to be reported. Now I had to analyse this information with respect to the missile launch from the USA and evaluate the computer information, say whether it is correct or not. Everyone was waiting for my assessment. According to prescription the time interval was fixed during which I should reach my decision. It was clear to me that I couldn't keep my military and political superiors waiting for too long. By the way: The name Andropov was mentioned today. Even he could not reach such a decision alone. Indeed we had a red button under a cover at our disposal in the unit, but the wires to the red button had all been cut. We had left the button there only to avoid having a hole in the control panel. It had no function at all! Scientists have researched for a long time as to whether or not a single human being can shoulder such a responsibility. The consensus is that an individual human cannot reach such a decision on his or her own. Furthermore, this decision should be made by computers, because they don't become nervous and can objectively assess the situation. But at that time I was first in line: I had to evaluate the computer's decision. I stood in front of a dilemma and pondered: Is this a provocation? Or has someone gone berserk? A mutiny? Actually this was impossible. We all knew the Russian security measures to prevent unauthorised launches, and in America it was no different. Hence, I could exclude such possibilities. The danger in my situation was that I did indeed have to reach this decision alone. I had only assistants who could give me advice, but I had no second-in-command. And I knew as well that my decision would not be changed once sent through channels, for it is much easier to agree with a decision already formulated than it is to generate a contradictory opinion. I could see this danger and was for my own part only up to 50 percent convinced that we were threatened by an actual attack. In reality I was not using my head to think. It was my experience of long years which let me find my way to the right decision. I had worked on the creation of the system. I knew it inside and out. My knowledge and intuition enabled me to make the right decision. I reached for the telephone and reported to the duty officer at the next higher combat centre: False Alarm. And I had not yet hung up when the siren sounded again. The duty officer in the higher post heard the siren as well over the telephone. He said, „Carry on“. With that he meant clearing the spurious alarm! This

meant that the second „launch" was treated as a false alarm as well. At that point I was exhausted. I knew that I had to stand up und go into another room because there was no civilian telephone connection at my post; I had to inform the commander responsible for the system via normal telephone. My knees were shaking, and I was sitting on a really fine office armchair, but despite that it seemed like a hotplate. Right. There had been one false alarm, but what now? We alerted the duty analysis group, who would be on the scene in twenty minutes. That was their reaction time. But suddenly the siren sounded yet another time; the computer indicated three missiles launched! I began to ask myself what this could be. Why an individual, then two, then a third? At that time there was a quite detailed doctrine about the start of the Third World War, which was, of course, „doctrined" as a nuclear conflict. In all of the prescriptions it was assumed that these actions would be begun by a massive launch und not by individual starts. We assumed that all the missiles would be launched at once. Naturally I knew that this doctrine at that time was already somewhat out of date, and a nuclear exchange could have been begun by individual starts as well. Were I today once again in such a situation, believe me, I would reach a decision different to that which I reached then. I would be compelled to do so because the world has changed in this area as well.

Was I right then, or not? Only the early warning radars on the ground could know that. They would have to recognise it if missiles with nuclear warheads were underway. Perhaps they would not have acquired them. We didn't know, but it meant that I had to wait a total of 17 minutes for either the confirmation or the all-clear signal to come from the radar groundstations. I felt as though I was just about to begin the walk to Golgotha, but the order had to be carried out further. So, I assumed that five missiles had been launched against us. We had at the time not only one satellite in the sky; we had three in use at the same time. One of these satellites was not directed at the military base. I waited and waited, and finally the ground radar confirmed: NO. That was a load taken from my shoulders. It meant that there were no missiles underway! My mood improved quite suddenly, and I switched on the loudspeaker. I thanked my crew for their outstanding work.

After that night an investigative commission was constituted; no reason was found for the false alarm, but there were many further discrepancies ascertained, which were attributed to scientists and higher-ranking military personnel. In the final analysis this commission said nothing, at least not to us in the unit. I think they were afraid that we would laugh very loudly at the conclusions of the analysts. Despite that, the commission found many discrepancies. Quite naturally it found found fault with me: I hadn't followed the textbook exactly. I had also to accept the reproach that I hadn't documented everything. But events at the time followed in

such quick succession that I wasn't able to write as things happened. I was then asked why I didn't document the events after the fact. My answer was that there is a body of criminal law, and that would have been forgery.

I must tell you that I never have attributed special importance to my work; admittedly it wasn't easy. But that a computer caused a false alarm left us standing in a bad light. I knew that the Americans had twice experienced false alarms in their system, and we also knew why. The Americans certainly aren't a nation of such secretive people as we are. We knew that as a result of one of these false alarms bombers were sent toward the North Pole, where indeed our interceptors were already waiting for them. We now have the situation under control. One can recall a long-range bomber, not an intercontinental ballistic missile. It was very unfortunate that this false alarm occurred. The circumstances were kept under the strictest secrecy. The soldiers in the Combat Centre, ten to twelve in total, knew of this; all the others didn't. All were sworn to secrecy; I didn't ever speak of the incident, merely did my job. Three days later I could finally relax properly.

After ten years I could talk about these events. In 1993 a large article was published dealing with our commanders in air defense, our cosmonaut-soldiers, and this incident. I was named, and it was clear to me that I could finally talk about it.

In conclusion I would like to thank you again for this great honour which you have done me – in Dresden. I am really very happy to have had the opportunity to visit the city and to have been able to meet with you. And perhaps I have been able in a small way as well to dilute even slightly the myth of the red button.